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# Montana Cooperative Wildlife Research Unit

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Montana Department of Fish, Wildlife and Parks,  
USDI Fish and Wildlife Service, University of  
Montana, and Wildlife Management Institute  
cooperating.

ANNUAL REPORT -- FY 1989

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Cover--Mountain goats, introduced to the Snake River Range, Idaho, during 1969-1971, numbered 141 by July 1983. Modeling suggested that growth through 1983 was not affected by density-dependence. Few kids in 1982, following an extremely severe winter, may have resulted from a density-dependent decrease in survival that year. The observed rate of growth from 1971 to 1983 was 0.22.

Photo by Bruce Smith



Most populations of Canada geese have prospered over the past several decades, in sharp contrast to several species of ducks in the Prairie Pothole and Parkland Region. Recruitment rates of geese are relatively high and stable in comparison to those of faltering duck populations.

Photo by John Craighead

ANNUAL REPORT

of the

MONTANA COOPERATIVE WILDLIFE RESEARCH UNIT

University of Montana

Missoula, Montana

to

UNIVERSITY OF MONTANA

MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS

WILDLIFE MANAGEMENT INSTITUTE

U.S. FISH AND WILDLIFE SERVICE, DEPARTMENT OF THE INTERIOR

Volume 6  
October 1988-September 1989

Respectfully submitted,

  
Bart W. O'Gara  
Bart W. O'Gara, Leader

  
Joe Ball  
Joe Ball, Ass't. Leader

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Site-specific management recommendations for bald eagles in Glacier National Park stress reducing human disturbances at foraging sites, maintaining old-growth, and screening vegetation at nest, forage, and roost sites.

Photo by Riley McClelland

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MONTANA COOPERATIVE WILDLIFE  
RESEARCH UNIT PERSONNEL

Coordinating Committee

Don Childress, Montana Department of Fish, Wildlife and  
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Lee Metzgar, University of Montana, Missoula  
Bart W. O'Gara, U.S. Fish and Wildlife Service,  
Missoula

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Joe Ball, Assistant Leader  
Kerry Foresman, Division of Biological Sciences  
Donald A. Jenni, Division of Biological Sciences  
Les Marcum, Forestry School  
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Roland L. Redmond, Division of Biological Sciences  
Andrew L. Sheldon, Division of Biological Sciences  
Richard Taber, Forestry School  
"Ginger" Schwarz, Office Manager  
Virginia Johnston, Secretary

Graduate Students

Tsui-lan Chen	Tom Maeder
Ana Dronkert	Jeff Marks
Sherry Eisner	Dan Miller
Salah Hakim	Chyi-Jai Pei
Nathan Hall	Denise Pengeroth
Rich Harris	Jon Rachael
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Michael Jimenez	Tim Van Deelen
Amy Johnston	Anne Vandehey
Eileen Kirsch	Amjad Virk
Victoria Kurnat	Peggy Wallgren
Chris Loggers	Rick Yates

COOPERATING AGENCIES

University of Montana  
Montana Department of Fish, Wildlife and Parks  
Wildlife Management Institute  
U.S. Fish and Wildlife Service

American Forest Foundation  
British Columbia Wildlife Branch, University of British Columbia  
Battelle, Pacific Northwest Laboratories  
Bureau of Indian Affairs  
Confederated Salish and Kootenai Tribes  
Council of Agriculture, People's Republic of China  
Fish and Wildlife Foundation  
Frankfurt Zoological Society  
Hubbard, Anna  
Lee, Robert M.  
Michael Murphy Foundation  
Moroccan Department of Waters and Forests  
Nebraska Game and Parks Commission  
Northwest College and University Association for Science  
Northwest Plateau Institute of Biology, Academia Sinica, Xining, P.R.C.  
Plum Creek Timber Company  
Shell Oil Company, Canada  
Simon Fraser University  
Taipei City Zoo  
U.S. Department of Energy  
U.S. Fish and Wildlife Service  
Alaska Fish and Wildlife Research Center  
Bowdoin NWR  
Charles M. Russell NWR  
Cooperative Research Units Center  
Division of Refuges, Region 4 and Region 6  
Grizzly Bear Recovery Coordination Office  
Lee Metcalf NWR  
Migratory Bird Management Office  
National Bison Range  
Northern Prairie Wildlife Research Center  
Pacific/Hawaiian Islands NWR  
U.S. Forest Service  
Flathead, Kootenai, and Lolo national forests  
U.S. National Park Service  
Glacier National Park  
U.S. Peace Corps

PERSONNEL NOTES

Honors and Awards Received by Unit Staff and Students

Award/Honor Received	Recipient	Reason
Wynn Freeman Award	Chris Loggers Unit Student	Outstanding wildlife student
George Fullbright Award	Chris Loggers Unit Student	Outstanding graduate scholastic achievement
Distinguished Scholar Award, University of Montana	Bart O'Gara Unit Leader	Outstanding wildlife research activities
Clancy Gordon Environmental Scholarship	Denise Pengeroth Unit Student	Exceptional scholastic achievement and wildlife research accomplishments
Einarsen Award, NW Section, TWS	Richard Taber Unit Staff	Professional contributions

The following personnel joined the Unit on nongraduate student appointments of varying length:

Canada Duck Banding and NPWRC Prairie Duck Production

Mary-Kay Belant	Keith Kalvik
John Coluccy	Shawne Leasure
Chris Dwyer	James Lutes
Joseph Hamlin	Brad Rogers
David Jones	

BIA-Kerr Dam Wildlife Studies

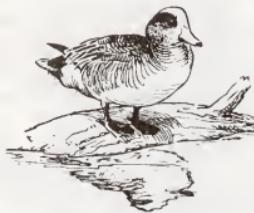
Dale Becker	Art Soukkala
Denver Holt	Brian Steele
Rosemary Leach	John Waller
Curtis Mack	

Other Field Studies

Susan Ball	Robert Morrow (V-S)
Steve Bennett (V-S)	Chris Norton
Rebecca Brown (V-S)	John Peterson (V-S)
Brian Gay (V-S)	Elena Pollot (V-S)
Paul Hendricks	Scott Ramsos (V-S)
John Hughes	Roly Redmond
Therese Jackson (V-S)	Eric Schmidt
Craig Marr (V-S)	Richard Sherwood (V-S)
Chris Mehus (V-S)	Paul Sweet (V-S)
Norman Merz (V-S)	Brett Williams (V-S)
Tim Miles (V-S)	

YCC and Work Study Students

Suzanne Decker	Gene Miller
Hank Huigen	Brita Schneller
Darren Johnson	Scott Soultz



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(V-S) = Volunteer with subsistence allowance.  
All others are paid positions.

ABSTRACT

Hayden, James A., M.S., Spring 1989

Wildlife Biology

Status and Population Dynamics of Mountain Goats in the Snake River Range, Idaho (147 pp.)

Director: B. W. O'Gara

An introduced population of mountain goats (Oreamnos americanus) was studied between April 1982 and August 1983. Introductions occurred from 1969-1971, resulting in a population estimated at 141 goats by July 1983. Modeling suggested growth through 1983 was not affected substantially by density-dependence. This population continued to grow rapidly during the study, but density-dependent changes in the growth rate appeared imminent. A low proportion of kids in 1982, following an extremely severe winter, may have resulted from a density-dependent decrease in survival that year. The observed rate of growth ( $\bar{r}$ ) from 1971 to 1983 was 0.22. Reproduction was high during the study, with 114 kids per 100 females 3 years of age or older. Twinning was common, with 29% of mature females observed with twins. Eighty-six percent of mature females were observed with at least 1 kid. The survival rate was estimated to be 92-94% for the population from July 1982 to July 1983. Observed kid survival was 88%, yearling survival was 95%, and average subadult/adult survival was 93%. Palisades Creek and Big Elk Creek drainages contained the only 2 concentrations of goats during winter. During summer most goats were found at high elevations immediately adjacent to the winter ranges. Yearlong densities were high, ranging from 3 to 16 goats/mi<sup>2</sup> (8 to 27 goats/km<sup>2</sup>). Minor movement was detected during summer to other portions of the Snake River Range and to the Teton Range.



Twenty-eight black bears were marked, 13 of them with radio collars, in extreme northwestern Montana during 1986 and 1987 for a study on population characteristics and effects of hunting. All bears were caught in foot snares and tranquilized for handling. Jab sticks, as pictured here, were the usual method of delivering the drugs.

Photo by Tim Thier

ABSTRACT

Thier, Timothy J., M.S., Fall 1989

Environmental Studies

Population Characteristics and the Effects of Hunting on Black Bears in a Portion of Northwestern Montana

Directors: T. Roy and B. O'Gara

Prior information regarding the status of black bears (Ursus americanus) in Hunting District 100 in extreme northwestern Montana was confusing and oftentimes conflicting. To gather information on the population and the effects of hunting, especially during the spring hunting season, 13 black bears were radio-collared and monitored during 1986 and 1987. An additional 15 bears were marked and released. Information was gathered on the age and sex structure of the capture sample, survival and mortality rates of marked bears, reproduction, home range sizes, and hunter technique and effort. A density estimate of 1 black bear/16.4 km<sup>2</sup> for the study area was determined. The age structure of captured bears was comprised primarily of adult males, indicating a lightly or unexploited population. However, the mortality of marked bears due to hunting was not only heavy but excessive. A decrease in the number of bears captured from 1986 to 1987, the large proportion of marked bears killed, and the 1987 spring observation data, indicates the study area population was well sampled by trapping. Illegal and unreported mortality may have contributed to the higher median ages observed and the decrease in the number of bears reported killed by hunters. A reproductive rate of 0.70 cubs/female/year was determined with at least 1 female not producing a successful litter until the age of 7. The mean home range size for adult males (5+ years) using the minimum convex polygon method was 98.7 km<sup>2</sup> with a range of 35.5 to 192.6 km<sup>2</sup> (n = 7). The home range size for adult females was 45.8 km<sup>2</sup> with a range of 17.5 to 107.4 km<sup>2</sup> (n = 4). Driving open roads was the primary hunting technique used during the spring hunting season. Thirty-nine percent of the bears killed during the spring season were shot within 100 m of an open road, with 66% of the bears killed first observed from an open road.



During 1987 and 1988, nest success of ring-necked pheasants in the Ninepipe area of western Montana was highest in uncultivated grass (47%) and lowest in strips (29%). Predation accounted for 57% (34/61) of nest failures. Predation was highest (42%) and nest success lowest (29%) in strip cover. Conversely, predation was lowest (32%) and nest success highest (44%) in uncultivated grass. Abandonment attributed to natural causes was higher in strip cover than in fields (29% vs. 21%).

Photo by John Ashley

ABSTRACT

Tsai, Kuenhi, M.S., Winter 1989

Wildlife Biology

Pheasant Nesting Study in the Flathead Valley, Montana (57 pp.)

Director: Bart W. O'Gara

Nesting densities and success and nesting habitat selection of ring-necked pheasants (*Phasianus colchicus*) were studied on the Ninepipe area of western Montana during 1987 and 1988. The cover types consisted of strip, cultivated grass, dense nesting cover (DNC), and uncultivated grass. Of the 115 nests recorded, the 41 nests that hatched averaged 11.2 eggs per clutch. Clutch size decreased as the season progressed. The highest nest density was found in strips (1.93 nests/ha) in 1987 and DNC (3.49 nests/ha) in 1988. During both years, nest success was highest in uncultivated grass (47%) and lowest in strips (29%). Predation accounted for 57% (34/61) of nest failures. Predation was highest (42%) and nest success lowest (29%) in strip cover. Conversely, predation was lowest (32%) and nest success highest (44%) in uncultivated grass. Abandonment attributed to natural causes was higher in strip cover than in fields (29% vs. 21%). Vegetative structure was evaluated at nest microsites (1 m centered on nests), nest macrosites (100 m), adjacent sites (10 m north of the nests), and random sites. The components of vegetative structure were: dominant plant species, mean plant height, visual obstruction (X Robel reading), and proportion of short grass (<60 cm), tall grass, forbs, litter, and bare ground. Relative proportions of short grass, tall grass, forbs, litter, and bare ground either between microsites and macrosites or between nest sites and adjacent sites in macrosites were not significantly different. For strip cover, discriminant function analysis (DFA) indicated that nest sites had less percent cover of short grass and more percent cover of forbs than did random sites. For the uncultivated grass, DFA indicated that nest sites had lower percent cover than random sites. The visual obstruction measurement at nest sites was higher than the adjacent sites. Pheasants evidently used the denser vegetation in strip, DNC, and uncultivated grass. Vegetative height was not considered important for nest site selection by pheasants. Relationships between vegetative structure and nest success were not significant.

## ABSTRACT

Yates, Richard E., M.S., Winter 1989

Wildlife Biology

Bald Eagle Nesting Ecology and Habitat Use: Lake McDonald, Glacier National Park, Montana (102 pp.)

Director: B. Riley McClelland

Bald eagle (*Haliaeetus leucocephalus*) nesting activity was studied at Lake McDonald in Glacier National Park, Montana from 10 January 1986 through 13 August 1987. In April 1986, after 18 days of incubation, the nest failed as an indirect result of food stress. Female mate replacement occurred in April 1987, but no egg was produced.

The adult male eagle was equipped with a radio transmitter in March 1986 and telemetry locations were used to determine defended territory (12.6 sq km), nesting home range (235 sq km), and regional range (over 3000 sq km) and to document nearly 3000 perch sites. Seasonal maps show the male eagle's relative frequency of use of specific perch sites. Foraging perches at Lake McDonald were concentrated at inlets, points, and shallow bays. Long-range movements to southeastern British Columbia (144 km from Lake McDonald) were documented in summers 1986 and 1987. The Primary Use Zone, the area where the eagles did most of their foraging and loafing, was mapped based on 3266 hours of observation. Roost sites were in proximity to the nest site during nesting and to foraging sites during non-nesting.

Threats to the resident pair include human disturbance, food stress, habitat loss, collision with vehicles or trains, shooting, and trapping. All 5 stream inlets on the territory are influenced by human activity and facilities. Human disturbance compounds the negative effects of the marginal prey base at Lake McDonald. Recent removal of old-growth vegetation along the lakeshore and at Lake McDonald Lodge has accelerated habitat deterioration. Site-specific management recommendations stress reducing human disturbances at foraging sites and maintaining old-growth and screening vegetation at nest, forage, and roost sites. Reduction of human disturbance and an increase in foraging opportunities at the head of Lake McDonald during the critical nesting season (1 Mar-15 May) and during autumn kokanee salmon (*Oncorhynchus nerka*) spawning runs (1 Nov-31 Dec) may improve bald eagle productivity at this breeding area.

## RESEARCH PROJECTS

### Physiologic and Ecologic Studies of the Pronghorn (*Antilocapra americana*)

Project Leader: B. W. O'Gara

Cooperators: National Bison Range, U.S. Fish and Wildlife Service; Montana Department of Fish, Wildlife and Parks; and the Wildlife Management Institute

#### Objectives:

To study:

1. the reproductive physiology of male and female pronghorn;
2. the physiology and function of scent glands;
3. food habits related to changes in range conditions;
4. horn growth and casting; and
5. the relationships of pronghorns to other artiodactyls.

#### Results:

Twelve chapters are in press in two books. When they are published, this project will be terminated.

### Duck Banding in Canada

Project Leader: I. J. Ball

Student Technicians: Varies, 4 to 6 annually

Cooperators: USFWS, Migratory Bird Management Office

#### Objectives:

1. Trap and band 2000 mallards and up to 1500 pintails and 1000 of each of the other species available. This quota will be sought at each of 10 banding stations.
2. Maintain accurate records and provide summary reports from each station to the Migratory Bird Management Office.
3. Provide students from the Montana Cooperative Wildlife Research Unit with training in waterfowl research techniques and an ecological perspective that can only be obtained through on-the-ground experience.

#### Results:

Vary annually. Detailed annual reports are available.

Nest Success of Upland-Nesting Ducks  
in the Flathead Valley

Project Leader: I. J. Ball  
Student Investigator: N. Hall  
Cooperators: USFWS, National Bison Range; Montana  
Department of Fish, Wildlife and Parks

Objectives:

1. Document nest success and, where possible, causes of nest failure on both removal and nonremoval areas.
2. Evaluate costs and benefits of skunk removal.
3. Attempt to quantify the relative importance of pair habitat; size, type, and condition of cover; and the presence or absence of predators.
4. Submit management recommendations.

Results:

Two searches were completed between 5 May and 3 July on both the removal and nonremoval areas. A total of 138 usable nests were located on 675 acres in the removal area. The Mayfield nest success of 44.3% (95% CI 35.7-54.9%) found this year represents a significant ( $P < 0.01$ ) increase over the 20% found for the previous 3 years. Although it can not be proven that this increase was a direct result of the predator removal, due to the study design, it can be strongly inferred. A total of 300 acres was searched in the nonremoval area, resulting in a total of 28 nests being found. Although this is an increase over last year, it is still too small a sample to estimate nest success. This thesis should be completed by spring 1990.

Age-related Reproductive Rates in the  
Striped Skunk

Project Leaders: I. J. Ball and K. Foresman  
Student Investigator D. Pengeroth  
Cooperator: USFWS, National Bison Range

Objectives:

1. Determine age-related reproductive rates among striped skunks.
2. Describe the reproductive characteristics of a striped skunk population in western Montana.

**Results:**

A predator removal program was initiated on 7 April 1988 and extended to 19 July 1988. The striped skunk had been identified as key predator on waterfowl production areas and was removed to improve nest success. Skunk removal commenced again 21 March 1989. Data gathered during these periods will be used to describe the reproductive characteristics of a striped skunk population in western Montana and to determine if a relationship exists between age and reproductive performance.

A total of 73 skunks were captured from 21 March through 6 July 1989 (109 skunks were captured during the 1988 season). Twenty-one skunks were adult pregnant females as determined by presence of fetuses; 13 were adult females, reproductive status undetermined; and 35 were adult males. The majority of skunks were found along irrigation ditch sites and in habitat classified as dense nesting cover. Laboratory analysis will determine age and reproductive rates.

River Otter Population Status and Habitat Selection in Northwestern Montana

Project Leader: L. Metzgar

Student Investigator: A. E. Dronkert

Cooperators: Montana Department of Fish, Wildlife and Parks

**Objectives:**

1. Document the distribution of river otters on northwest Montana waterways.
2. Identify and map habitat for otters on northwest Montana waterways.
3. Quantify habitats used by otters in the Flathead River above Flathead Lake and compare with habitat availability in this area.
4. Determine otter population size in the study area.
5. Model the effects of harvest on river otters in the study area.

**Results:**

A draft of the thesis has been submitted and is undergoing revision.

Ecology of Bald Eagles Wintering Along the  
Columbia River in South-Central Washington

Project Leaders: I. J. Ball and B. R. McClelland

Student Investigator: S. A. Eisner

Cooperators: Northwest College and University Association  
for Science; U.S. Department of Energy; and  
Battelle, Pacific Northwest Labs

Objectives:

1. Determine the combination of environmental factors that best explains bald eagle distribution along a 136-km stretch of the Columbia River between the Tri-Cities and Wanapum Dam. Compare diurnal and nocturnal distribution on the Hanford portion of this stretch.
2. Summarize perch use over the entire study area and for perch trees on the Hanford Reach, characterize individual trees and tree clumps used for diurnal and nocturnal perches and compare with trees not used.
3. Describe and quantify communal night roost behavior.

Results:

A draft of the thesis is complete, and is undergoing revision.

Nesting Structures for Mallards and Canada Geese: a Handbook

Project Leader: I. J. Ball

Research Assistant S. K. Ball

Research Cooperator: F. B. Lee

Cooperators: USFWS: Division of Refuges, Region 6, Region  
4, and CUC Extension

Objective:

Produce a practical handbook on the use of waterfowl nesting structures that will allow managers to make informed decisions about structure design and placement that will maximize effectiveness, durability, aesthetic appeal, and nest security, and minimize construction and maintenance costs.

Results:

The draft handbook has been reviewed and is being revised. A chapter on goose nest structures has been submitted to OIT for use in the FWS Waterfowl Management Handbook.

River Otter Habitat Use in  
Northwest Montana

Project Leaders: L. Metzgar

Student Investigator: A. Johnston

Cooperator: Montana Department of Fish, Wildlife & Parks

Objectives:

1. Evaluate the use of sign surveys for indicating river otter habitat through discriminant comparisons of latrine site and non-latrine site radio locations.
2. Identify habitat components of significance to river otters within seasonal home ranges through discriminant comparisons of radiolocations and random sites.
3. Refine survey techniques to document the distribution of river otters in northwest Montana.

Results:

The student investigator is working on her thesis but has not submitted a draft.

Beaver Dispersal in Northwestern Montana

Project Leaders: L. Metzgar and D. Pletscher

Student Investigators: M. Jackson and T. VanDeelen

Cooperators: Montana Department of Fish, Wildlife and Parks; Lolo National Forest

Objectives:

1. Quantify survivorship of dispersers and direction and distance of beaver dispersal in selected drainages in northwestern Montana.
2. Survey selected drainages to delineate experimental areas and determine the availability of habitat for dispersing beavers.
3. Gather supplemental data on age, sex, and productivity of beaver populations within the selected study areas.

Results:

Jackson is finalizing his thesis on aging techniques and dispersal movements. Van Deelen is continuing the study of beaver dispersal and its effect on beaver population dynamics. Several dispersal-aged beavers have been radio-collared and are being monitored. This field season has generated good movement data and

some data on the survivorship of dispersing beavers.

During winter 1990, Van Deelen will attempt to model local beaver population dynamics with information gained from cooperating trappers and this year's harvest. The model will help to validate observed population-dispersal interactions. He will also begin trapping for next year's sample of dispersal-aged beaver. New transmitters will be equipped with mortality switches in an effort to refine the survivorship data. Monitoring of all radioed beavers will continue through 1990.



#### Effects of Motorized Road Use on Grizzly Bear Behavior, Habitat Use, and Reproductive Success

Project Leader: C. Servheen

Field Leader: B. N. McLellan

Technicians: T. Radandt  
F. Hovey  
D. Reiner  
A. Vandehey

Cooperators: U.S. Fish and Wildlife Service, Region 6,  
Grizzly Bear Recovery Coordination Office;  
British Columbia Wildlife Branch,  
The University of British Columbia;  
Simon Fraser University;  
The Fish and Wildlife Foundation;  
Plum Creek Timber Company;  
The American Forest Foundation;  
Shell Oil Company, Canada

#### Objectives:

1. Assess effects of road use and industrial activity on grizzly bears.
2. Describe activity patterns of grizzly bears.
3. Determine interactions between grizzly and black bears.

**Results:**

Only a minor amount of timber harvest and seismic work and some tree planting was conducted in the study area in summer 1989, and immediate reactions of bears to industry received little attention. Emphasis was on estimating habitat quality to be used as a link to carrying capacity, population dynamics and dispersal, the black-grizzly competition study, use/value of cutting units versus timbered sites, and ecology of mountain resident bears.

Some trapping was conducted in early July and again in late September. This effort resulted in the capture of 14 black bears (4 collared) and 2 grizzly yearlings (1 collared). Radio-collared grizzly bears were relocated approximately 300 times during July, August and September 1989, while blacks were found about 250 times. The activity patterns of bears recorded continuously for up to 24 hours per day were obtained for about 30 24-hour sessions. As well, hourly scan samples of the activity of collared bears that could be monitored from a 6500-foot mountain were recorded for 5 24-hour sessions.

Anne Vandehey, a M.Sc. student from the University of Montana, continued her project that will estimate quantity and quality of bear foods in various habitat units. She used the British Columbia habitat capability maps to stratify the study area and tested several sampling regimes for the various bear foods for each strata. She has returned to the University of Montana for course work, preliminary analysis of data so far collected, and finalizing the best methods to be used next field season.

The capture collar was used on a second subadult male black bear. He was first captured and marked on 7 June and he weighed 45 kg. He was recaptured on 30 June, weighed 49 kg, and had the capture collar attached (he had gained 0.17 kg/day). He was remotely immobilized on 9 July and weighed 55 kg for a gain of 0.67 kg/day.

Data at approximately 55 bear-use plots were recorded. About 60 scats, most from known individuals, were collected, dried, and stored.

Adult female No. 36 was observed twice in the spring and no cubs were seen; however, two cubs were observed with her in July. The young cubs must have been hidden during the spring observations. No. 36 therefore had a 3-year interbirth interval. Female No. 23, who was recaptured in June, was seen with three yearlings. She also had a 3-year interval.

Subadult male No. 66 was killed by another bear while traveling with adult female No. 38 who was in estrus at the time. Subadult male No. 70 was captured and removed from the study area because he became conditioned to people's pet food.

An unmarked adult female who had two yearlings approached a hunter and he shot and killed the bear. We captured the two yearlings shortly after.

Of the radio-collared black bears, a large male was killed by a grizzly and an adult female was shot and left intact during the hunting season in British Columbia.

Home Range Dynamics, Dispersal, and Reproduction  
of Reintroduced Fishers (*Martes pennanti*) in the  
Cabinet Mountain Wilderness Area, Montana

Project Leader: L. Metzgar

Technicians: K. Roy and K. Heinemeyer

Cooperators: Kootenai National Forest, Montana Department  
of Fish, Wildlife and Parks, and  
Anna Hubbard Pennell

Objectives:

1. to restore a viable fisher population to the Cabinet Mountains;
2. to explore the feasibility and mechanisms of fisher reintroduction;
3. to monitor the home range dynamics and dispersal of reintroduced fishers;
4. to determine the initial reproductive success of transplanted fishers; and
5. to investigate the habitat utilization of transplanted fishers in Montana.

Results:

Twelve fishers, 7 females and 5 males, were obtained from the Red Lake Wildlife Management Area in northwest Minnesota between 1 November and 15 December 1988. The fishers were transported back to Montana, equipped with radio collars, and gentle-released in the Cabinet Mountains as part of a reintroduction effort. Most fishers remained within 15 km of the release sites from January to March, but ranges increased dramatically in late March in conjunction with the breeding season. One male fisher was trapped by a commercial trapper 23 days post release; autopsy revealed he was in excellent condition. A female with 3 kits was killed by a coyote in early May; autopsy again revealed her to have been in excellent physical condition.

Trapping is again underway in Minnesota and we expect to obtain an additional 15 fishers to supplement last year's release.

Kerr Dam Wildlife Studies

Project Leaders: J. J. Claar and I. J. Ball

Project Biologists: D. Becker, R. Leach, C. Mack, and A. Soukkala

Cooperators: U.S. Bureau of Indian Affairs, Confederated  
Salish and Kootenai Tribes

Objectives:

1. Determine the effects of the Kerr Project on bald eagles and ospreys
  - a. hunting success,
  - b. feeding site selection,
  - c. food habits, and
  - d. reproduction.
2. Document distribution of furbearer species along the river and lake.
3. Correlate furbearer distribution with riparian vegetation types and other factors.
4. Estimate relative abundance of furbearer species.
5. Determine effects of water level fluctuations on furbearers and habitat.
6. Formulate management and mitigation recommendations necessary to protect and enhance riparian habitat and furbearer population levels.

Results:

The draft final report is complete and is being reviewed.

Habitat Selection and Productivity of Interior Least Terns on the Lower Platte River, Nebraska

Project Leader: L. Metzgar

Student Investigator: E. Kirsch

Cooperators: Nebraska Game & Parks Commission and USFWS,  
Northern Prairie Wildlife Research Center

Objectives:

1. Quantify productivity of resting terns and plovers on sandbar and sandspoil habitats..
2. Determine if habitat and disturbance factors influence productivity.
3. Determine the population status of terns on the lower Platte River.

Results:

The third field season investigating productivity of least terns and piping plovers on sandbars and spoilbank habitat was completed. Availability of nesting habitat for least terns along the lower Platte River was investigated during summer 1989. Habitat selection by least terns was investigated using videography techniques. Further productivity and habitat data will be collected in 1990, and the dissertation should be completed by spring 1991.

Status and Demography of the Bristle-thighed Curlew

Project Leaders: R. L. Redmond and I. J. Ball

Student Investigator: J. S. Marks

Cooperators: U.S. Fish and Wildlife Service, Alaska Fish and Wildlife Research Center, and the Pacific Islands NWR

Objectives:

1. Estimate numbers of curlews (by age class) present on Laysan during the summer.
2. Estimate the minimum proportion of ASY (after second year) curlews on Laysan that forego a northward migration to Alaska.
3. Monitor the timing of the fall migration of ASY and HY (hatch year) curlews from Alaska, and evaluate the duration of stopover by ASY migrants.
4. Complete the description of the second prebasic wing molt of SY (second year) curlews and determine if, and for how long, individuals of this age class become flightless.
5. Conduct a preliminary evaluation of habitat use and local movement patterns of SY and ASY curlews during the study period.
6. Collect blood samples from two curlews of each sex for use in developing a noninvasive method of sex determination by DNA hybridization technique.

Results:

Bristle-thighed curlews were studied on Laysan Island between 28 June and 8 September 1989. Eighteen censuses were conducted during this period to monitor curlew numbers. In addition, regular watches and counts were made at rock ledges around the island where many curlews tended to congregate during the day.

Of the 150 curlews that were uniquely color-banded last fall, we saw 125 during our stay on the island. These resightings included 43/49 SY's, 16/18 TY's (third year), and 66/83 ATY's (after third year). Estimates of annual survival based on these resightings are remarkably high, especially considering the likelihood that we missed some migratory individuals. We hope to continue color-banding next year and to obtain resightings for another 2 years to obtain more precise estimates of annual survival for the different age classes.

Prior to 18 July, only two known ATY's were seen on Laysan. Presumably most of these curlews migrated to Alaska to breed. In contrast, nearly all of the color-banded SY's were resighted during June and/or July, as were most of the TY's (11/18). Thus, it appears that most bristle-thighed curlews do not migrate north to Alaska until at least their third year.

Based on resightings of uniquely color-banded adults (ATY's), we detected four distinct pulses of arrival at Laysan this summer.

The first occurred between 18 and 20 July and presumably involved failed or nonbreeders from Alaska. The second (6-8 August) and third (16-18 August) pulses probably included successful breeders. The first HY curlews were seen on 29 August, and HY's continued to arrive through at least the first week in September. Our resightings indicate that some adults (ATY's) probably also arrive with the HY's in late August or early September.

Throughout most of August and early September, we observed 100-200+ curlews daily. In one day alone, we saw 87 different color-banded individuals. In spite of this exposure, however, we did not see any of the bristle-thighed curlews banded this summer in Alaska. In fact, the only curlew that was color-banded in Alaska and that we resighted on Laysan was the one captured on the Yukon Delta NWR during 1988 and recaptured last fall on Laysan (#794-28007). We resighted this bird 7 times between 22 July and 1 September. Other noteworthy sightings included two individuals banded by biologists with the Pacific Ocean Biological Survey Program in September 1967. One was banded as a HY on Laysan. It was recaptured last fall on Laysan and color-banded (#564-02861). The other was banded on Lisianski Island (#564-00019). Both would be at least 22 years old this year. We checked regularly for signals from the 10 radio-transmitters placed on curlews in Alaska, but none was detected.

During our stay on Laysan this summer, we captured 85 different bristle-thighed curlews: 51 of these were initial captures of unbanded individuals, 10 were recaptures of birds banded during the spring of 1988 with just blue color-bands, 22 were recaptures of uniquely color-banded individuals. We captured two additional curlews that were unable to fly. Each had a broken wing that was probably sustained in a mid-air collision with another bird. We sacrificed both these injured birds because we needed blood samples from at least one individual of each sex to develop a non-invasive method of sex determination. Fortunately, one was a male and the other a female. We also collected 2-3 cc blood samples from 33 other curlews. Most of these birds were resighted repeatedly, and no ill effects were observed. We plan to use the blood samples for sex determination and for measuring levels of environmental pollution and genetic variation.



Dorcas Gazelle (Gazella dorcas)

Ecology in Morocco

Project Leader: B. W. O'Gara

Student Investigator: C. Loggers

Cooperators: Moroccan Department of Waters and Forests,  
Peace Corps, Frankfurt Zoological Society

Objectives:

1. Document population size and structure, and reproductive rates of dorcas gazelles at the MK'Sabih Talaa Reserve near Marrakech, Morocco.
2. Determine the gazelles' feeding habits in relation to availability.
3. Describe the males' territorial activities.
4. Assess current distribution and status of Morocco's wild bovids.

Results:

Reserve population size fluctuated slightly by season. Territorial behavior appeared strongest during the late fall and early winter, though most territories were maintained the entire year. Fawning peaked twice yearly, in the late fall and spring. Analysis of fecal data suggest the animals switch feeding habits during summer months.

All extant wild ungulates in Morocco, except the wild boar, are listed as endangered species by IUCN. Hartebeest were extirpated in the early 1900's. Addax and oryx have not been recorded since the 1950's and are presumed extirpated. The only available report of dama(mhorr) gazelle comes from Tindouf, on the Algerian border. The distribution of dorcas (*G. dorcas*) and Cuvier's (*G. cuvieri* or *G. g. cuvieri*) as well as that of Barbary sheep (aoudad) (*Ammotragus lervia*) are fragmenting rapidly.



Mortality of White-tailed Deer in an  
Area Recently Recolonized by Wolves

Project Leader: D. Pletscher

Student Investigator: J. Rachael

Cooperators: US Fish and Wildlife Service, British Columbia  
Wildlife Branch, Flathead National Forest,  
Montana Department of Fish, Wildlife and  
Parks, and Glacier National Park

Objectives:

1. Evaluate cause-specific mortality of white-tailed deer within the area recolonized by wolves.
2. Describe seasonal distribution of white-tailed deer, including migration patterns and key areas of seasonal use.
3. Select techniques and initiate sampling strategy to develop an index of deer abundance.
4. Determine age and sex structure of white-tailed deer population.

Results:

All equipment and supplies have been ordered and are in the process of being assembled. Three separate trapping regions have been identified within the study area. A finalized study plan will be complete by late October. Beginning in late December, 30 white-tailed deer will be trapped and instrumented with radiocollars equipped with mortality sensors.



Alternative Management Strategies for  
Musk Deer in Qinghai Province,  
People's Republic of China

Project Leader: B. W. O'Gara

Student Investigator: R. B. Harris

Cooperators: Northwest Plateau Institute of Biology,  
Xining, P.R.C.; D. Michael Murphy Foundation

Objectives:

1. To document the breeding and social structure of harvested and unharvested musk deer populations in the vicinity of the Gar Lamasery, Baeiza Forest, Nangqian County, Qinghai.
2. To quantify survival and recruitment rates of harvested and unharvested musk deer.
3. To assess the economic benefits potentially available to the local community from the sale of musk under varying harvest management programs.
4. To assess the social potential for implementing alternative harvest management programs on a local level.

Results:

The project leader and student investigator were accompanied to the study area during summer 1988 by cooperating biologist Cai Guiquan. Musk deer were observed on three different occasions. Plans were made for initiating field studies during summer 1989. Tangle nets were modified for capturing musk deer.

Predation on Natural versus  
Artificial Waterfowl Nests

Project Leader: I. J. Ball

Student Investigator: V. Kurnat

Cooperator: US Fish and Wildlife Service: Refuges, Region 6; National Bison Range; Metcalf NWR; C. M. Russell NWR

Objectives:

1. Develop a standardized, widely applicable method for using artificial nests to assess natural nest predation on ground-nesting ducks.
2. Determine whether the use of artificial nests can provide a reliable index to predation on natural nests.
3. Test the hypothesis that scented nests attract a more representative sample of local predator populations than unscented nests.

Results:

Field work began in May 1989. A total of 900 artificial nests were placed and monitored at nine sites throughout Montana. Shells from all destroyed nests along with wax impression eggs were collected for analysis. Natural nest success was assessed at each site using the cable-chain drag developed by Klett et al. (1986). Natural nest success ranged from a low of 0% to a high of 96.0%, while artificial nest success ranged from 6.4% to 98.2%. Further analysis will determine the relationship between the artificial and natural nest success scores. A second field season will begin in May 1990.

Status of the Grizzly Bear in the  
Cabinet Mountains, Montana

Project Leader: Christopher Servheen

Field Director: Wayne Kasworm

Field Biologists: Timothy Thier, Michael Jacobs, Catherine Schloeder

Cooperator: USFWS, Office of Grizzly Bear Recovery Coordinator

Objectives:

1. Develop information on habitat use and movement patterns of grizzly bears in the area. Determine habitat preference by season and assess the relationship between habitats affected by man such as logged areas and grizzly bear habitat use in the Yaak. Determine the relationship and movement patterns between the grizzly bears in the U.S. and Canadian areas of the Yaak.
2. Initiate methods to determine the population characteristics of the Yaak grizzly population in terms of reproductive success, age structure, and mortality causes.

3. Initiate methods to determine the relationship between human activity and grizzly bear habitat uses through description of avoidance zones, should they exist, and the use of habitat in relation to ongoing logging, old cutting units, open and closed roads, and human residences.
4. Suggest management techniques to limit human-induced mortality of grizzly bears in the Yaak area.

Methods:

1. Initiate a capture and marking program to sample grizzly bears in the Yaak.
2. Monitor by aircraft and ground tracking radio-collared bears captured in the Yaak.
3. Initiate habitat productivity sampling to compare the productivity of major bear foods such as Vaccinium spp. to similar habitat components in the Cabinet Mountains portion of the Cabinet Yaak ecosystem.
4. Suggest management techniques to limit human-induced mortality of grizzly bears in the Yaak area.

Results:

This project began during August 1989 and is primarily in the preparation phase.

Biology and Population Analysis of  
Formosan Reeves' Muntjac in  
Gio-Gin-Ying, I-lan, Taiwan

Project Leader: B. W. O'Gara

Student Investigator: C. J. Pei

Cooperators: Council of Agriculture, Republic of China;  
Taipei City Zoo.

Objectives:

1. Determine the growth and development biology, and tooth wear pattern for the muntjac.
2. Determine the reproductive characteristics and breeding season.
3. Analyze the structure for the muntjac population within the study area.
4. Construct life table and fecundity table for the muntjac population in the study area.

**Results:**

Field work was conducted through the winter of 1988-1989. A total of 439 individuals, which were taken from the study area, were examined in a game shop during December 1988 and January 1989. Organs were collected whenever they were available during the course of examination; 65 skulls were collected and their ages were later estimated by the count of cementum layers of the roots of first lower molars. Data collected from these skulls were then used as aging criteria to age the remainder of the sample.

Supplementary data were also collected from a captive population in the Taipei City Zoo from August 1988 through September 1989. Information gathered from the Zoo includes birth records, antler cycles adult males, and the sequence of tooth growth and replacement, which was determined by taking X-ray photographs periodically of skulls of known-aged animals.

The student has returned to University of Montana to continue course work. Data analysis is underway, and the dissertation is expected to be completed by June of 1990.

**Seasonal Range and Habitat Selection by  
White-tailed Deer in Northwestern Virginia**

Project Leader: B. W. O'Gara

Student Investigator: S. A. Hakim

Cooperators: National Zoo's Conservation and Research Center, Front Royal, Virginia

**Objectives:**

1. Determine seasonal home range size and distribution relative to habitat.
2. Compare seasonal habitat selection of deer.
3. Identify variables that influence such selection and look at seasonal changes.
4. Determine if seasonal activity patterns are related to home range size or forage availability.
5. Describe family interactions and group size.
6. Estimate population structure.

**Results:**

Data are being collected in northwestern Virginia. Home range size and location are determined by monitoring 10 radio-tagged white-tailed deer. Quantitative vegetation analysis is conducted on deer locations and random locations throughout the study area. Data on feeding habits, habitat use, and other behavior patterns are collected through direct observations. Road counts and deer trapping are carried out regularly. Data collection will be completed by mid-April 1990.

**CONSERVATION, EDUCATION, AND PUBLIC RELATIONS**

Bart O'Gara, Unit Leader

4-5 October Attended Region Six Unit meetings in Denver, Colo., and presented a review of Unit projects.

17 October Presented a slide-assisted lecture on wildlife research and management in China to Ravalli County Sportsmen's Club in Hamilton, Mont.--about 60 members.

18 October Conducted mountain goat trapping operation for the National Bison Range and Montana Department of Fish, Wildlife and Parks.

20 October Gave a 3-hour lecture on identifying predator kills to Wildlife Techniques class--10 graduate students.

2 November Necropsied a pronghorn for Large Mammal Conservation and Wildlife Techniques classes on the National Bison Range--10 graduate and 40 undergraduate students.

3 November Presented a slide-assisted lecture on predation to the University of Montana Chapter of TWS--about 80 students and general public.

7 November Participated in an elk/people management meeting with the Forest Service and Montana Department of Fish, Wildlife and Parks personnel.

14 November Tranquilized three bull elk on the National Bison Range for movement to another refuge.

14 November Presented a 3-hour slide-assisted lecture on Montana carnivores and predation to Montana Wildlife class --45 non-wildlife majors.

16 November Presented a 3-hour, slide-assisted lecture on trapping and immobilizing large mammals to Large Mammal Conservation class--40 undergraduate students.

30 November Assisted National Bison Range and Confederated Salish and Kootenai Tribes personnel in capturing 50 pronghorns for transplant.

17 January Presented a slide-assisted seminar on game ranching in southern Africa--about 30 seniors and graduate students.

24-27 January	Captured five elk for the North Dakota Department of Fish and Game.
13 February	Presented a slide-assisted lecture on predation at Big Sky High School, Missoula, Mont., to juniors and seniors--80 students.
16 February	Presented the quarterly "Faculty Abroad" lecture at the University of Montana on the Sister Institution Agreement and Wildlife Research in China--about 65 faculty and general public.
22-24 February	Attended Nongame Symposium and Montana Chapter TWS meeting in Missoula, Mont.
2 March	Presented a slide-assisted lecture on wildlife management, or lack of it, in western China to Exchange Club--41 members.
9 March	Presented a slide-assisted lecture on wildlife management in Heilongjiang Province, P.R.C., and Taiwan to Exchange Club--49 members.
30 March	Presented lecture on predation to Wildlife Issues class--about 75 graduate and undergraduate students (mostly non-wildlife majors).
10-14 April	Attended annual meeting, NW Section TWS, Banff, Alberta, Canada.
20 April	Presented a lecture at the University of Montana to 20 dignitaries from 12 western African countries on ways to preserve wildlife and, at the same time, make it valuable to their governments and to local people.
25 April	Gave a talk on the future of wildlife in Montana to annual meeting of the Montana Chapter of the American Society of Foresters in Kalispell, Mont. --about 60 foresters and representatives of the lumber industry.
9 May	Presented a slide-assisted program on wildlife in China to the Prickly Pear Sportsmen's Club, East Helena, Mont.--32 members.
12 May	Presented 4 hours of lectures at the Superior, Mont. Outdoor School on how a scientist works, wildlife techniques and management, and ethics of sport hunting--48 fifth grade students.

16 May Presented a slide-assisted program for Florence-Carlton High School Career Days at Florence, Mont., on wildlife research--18 seniors.

24 May Participated in an all-day meeting of the Advisory Committee for Research in Second Growth Forests at the University of Montana.

9 June Reviewed a 14-page manuscript for the Journal of Wildlife Management.

14-18 June Met with the Director and Senior Mammalogist of the Xinjiang Institute of Biology, Pedology, and Desert Research, Urumqi, Xinjiang Province, P.R.C., to discuss possible research in that Province. Also took them on a tour through Yellowstone National Park.

27-30 August Toured the pronghorn range in Yellowstone National Park and met with six Park officials at Mammoth, Wyo., at their request, to make recommendations for pronghorn studies and possible range improvements to benefit pronghorns.

1 September Met with the Land Management Committee of the Wildlife Federation to discuss the value of conservation easements proposed by local land developers.

Joe Ball, Assistant Unit Leader

4-5 October Attended Region Six Unit meetings in Denver, Colo.

October-November Instructed and scheduled 40 undergraduate students for manning Montana Department of Fish, Wildlife and Parks game check stations.

7 November Lectured in Wildlife Careers class, Univ. Montana.

7 November Lectured in Montana Wildlife class, Univ. Montana.

15,16, and 17 November Lectured on "Scientific Method" to Wildlife Techniques class--12 students.

8 February Attended meeting of North Dakota Chapter, TWS, in Minot, ND.

23-24 February Attended meeting of Montana Chapter, TWS, in Missoula, MT.

3 May Led discussion of "Nongame Wildlife and Why It Is Neglected" at a meeting of wildlife students concerning curriculum matters.

12 May                  Reviewed a 9-page manuscript for the Journal of Wildlife Management.

31 May                  Delivered lecture on waterfowl and upland game bird management in the Flathead Valley at a meeting of Big Sky Upland Game Bird Association--30 members.

22 September            Refereed 15-page manuscript for Journal of Wildlife Management.

25 September            Talked on waterfowl management at meeting of Ravalli Sportsmen's Club--25 members.

26, 27, and 28 September            Lectured to Advanced Wildlife Conservation class --40 students.

29 September-  
1 October            Attended Idaho Pheasant Symposium meetings, Boise, Idaho.

Les Marcum

December                Served on Rocky Mountain Elk Foundation (RMEF) banquet committee.

1 December              Gave presentation on the history of elk research at the University of Montana at dinner for RMEF and University of Montana wildlife staffs.

6 February              Talked on history of elk research at University of Montana to UM Student Chapter TWS.

22 February             Attended Non-game Symposium in Missoula, Mont.

24-25 February            Attended annual meeting of the Montana Chapter, TWS, Missoula, Mont.

10-14 April             Attended and organized University of Montana graduate student participation in annual meeting of the Northwest Section, TWS, Banff, Alberta, Canada.

5 May                    Gave a talk on elk and timber management at a meeting of the Bitterroot Chapter of the Audubon Society in Hamilton, Mont.

Dan Pletscher

24-25 February            Attended annual meeting of the Montana Chapter, TWS, Missoula, Mont. and presented a paper.

19-22 March Attended North American meetings, TWS, in Washington, D.C.; chaired International Affairs Committee.

April Presented two seminars at the University of Puget Sound on "Wolf Recovery in the Northern Rockies" and "Wolves in Glacier National Park."

April Attended Yellowstone Wolf Symposium and gave talk, "Characteristics of the Colonizing Wolf Population in the Glacier National Park Area."

April-June Coordinated Predator/Prey Lecture Series, University of Montana--five speakers.

26-28 July Attended National Wildlife Federation's Annual Grizzly-Wolf Technical Workshop, near Polebridge, Mont.; talked on wolf/ungulate research.

Roly Redmond

December Completed a 2-year term as president of the Five Valleys Audubon Society.

25 May Refereed a 27-page manuscript for Oikos.

20-22 September Taught a session on forest bird ecology during a Sussex School field trip to Camp Paxson--35 students.

Andrew Sheldon

April Served on advisory group to write regulations for commercial harvest of crayfish for Montana Department of Fish, Wildlife and Parks.

April Gave biology seminar at Montana State University, Bozeman on ecology of fishes in southeastern blackwater streams.

Richard Taber

June Organized and directed short-course in research techniques for Raghunath Chendawat, Wildlife Institute of India, in cooperation with D. H. Pletscher, and under the sponsorship of the International Snow Leopard Trust.

Tsui-Lan Chen

12 June Attended Wildlife Conservation Conference in Taipei, R.O.C., and presented paper.

28 June Attended annual meeting on Natural Resources in Taipei, R.O.C.

26-28 July Attended National Wildlife Federation's Annual Grizzly-Wolf Technical Workshop, near Polebridge, Mont.

Nathan Hall

24-25 February Attended annual meeting of the Montana Chapter, TWS, in Missoula, Mont.

29 September-  
1 October Attended Idaho Pheasant Symposium meetings, Boise, Idaho.

Mike Jimenez

January Gave presentation on wolves to East Kootenay Hunters' Association.

Eileen Kirsch

24-27 October Attended meeting of the Colonial Waterbird Society and presented paper, Washington, DC.

Vickie Kurnat

22 February Attended Non-Game Symposium in Missoula, Mont.

24-25 February Attended annual meeting of the Montana Chapter, TWS, in Missoula, Mont.

15 March Attended annual meeting of the Montana Trappers' Association in Kalispell, Mont.

22 March Attended annual meeting of the Flathead Valley Canada Goose Commission, National Bison Range, Mont.

Chris Loggers

October                   Lectured on Peace Corps and wildlife management to 50 students in Survey of Wildlife Careers class, University of Montana.

22 February              Attended Non-Game Symposium in Missoula, Mont.

24-25 February          Attended annual meeting of the Montana Chapter, TWS, in Missoula, Mont.

April                     Lectured on Peace Corps and wildlife management to 10 senior wildlife biology students in undergraduate seminar.

10-14 April             Attended annual meeting of the Northwest Section, TWS, Banff, Alberta, Canada.

4 May                    Conducted an all-day field birding trip for members of the Wildlife of Montana class at University of Montana.

12 May                   Presented program, "Wildlife of Morocco," to Graduate Seminar, University of Montana.

Tom Maeder

29 September-  
1 October         Attended Idaho Fish and Game Pheasant Workshop in Boise, Idaho.

Denise Pengeroth

10-14 April            Attended annual meeting of the Northwest Section, TWS, Banff, Alberta, Canada.

25 May                  Gave presentation on wildlife to second grade pupils in the Wilson School Educational Outreach Program in Missoula, Mont.

Kevin Roy

15 March                Gave a 45-minute presentation on the status of reintroduced fishers in Montana to a meeting of the Montana Trappers Association in Kalispell, Mont.

10-14 April             Attended annual meeting of the Northwest Section, TWS, in Banff, Alberta, Canada.

26-28 July Attended National Wildlife Federation's Annual Grizzly-Wolf Technical Workshop, near Polebridge, Mont.

27 September Presented an update on the fisher project to Missoula area trappers.

Tim Van Deelen

May Lectured on beaver research to seventh grade students in Rattlesnake School, Missoula, Mont.

September Gave a presentation on beaver research to Missoula area members of the Montana Trappers' Association.

Amjad Virk

6-15 June Attended a 10-day International Workshop on Management Planning for Khunjerab National Park in Gilgit, Pakistan.

Peggy Wallgren

2 June Talked on riparian ecosystems to Missoula 8th graders (approximately 20 students); arranged by TWS Educational Outreach Program.



PAPERS PRESENTED

Kirsch, E. 25 October 1988. Habitat differences and productivity of least terns on the Lower Platte River, Nebraska. Colonial Waterbirds Society, Lincoln, Nebr.

Chen, Tsui-Lan. 21 November 1988. The biological study of brown noddy and bridle tern in Catisset, the Pescadores. Biological Society Annual Meeting (XXI), National Taiwan University, R.O.C.

Pletscher, D. H. 25 February 1989. Wolves in the Glacier National Park area: an update.

Roy, K. D. 15 March 1989. Reintroduction of fishers to Montana--project status. Montana Trappers Association, Missoula, Mont.

Yates, R. 12 April 1989. Bald eagle home range, perch sites and conflicts with recreation use in Glacier National Park, Montana. 40th Annual Meeting, Northwest Section of the Wildlife Society, Banff, Alberta, Canada.

Costain, B. 13 April 1989. Habitat use by Shiras moose in a heavily logged region of northwest Montana. 40th Annual Meeting, Northwest Section of the Wildlife Society, Banff, Alberta, Canada.

Hayden, J. A. 13 April 1989. Easy time for deer--what now? 40th Annual Meeting, Northwest Section of the Wildlife Society, Banff, Alberta, Canada.

Kratville, S. P. 13 April 1989. Elk distribution as influenced by cattle in east-central Idaho. 40th Annual Meeting, Northwest Section of the Wildlife Society, Banff, Alberta, Canada.

O'Gara, B. W. 13 April 1989. Management rather than protection to save China's wild ungulates. 40th Annual Meeting, Northwest Section of the Wildlife Society, Banff, Alberta, Canada.

Sheldon, A. L. April 1989. Ecology of fishes in southeastern blackwater streams. Biology Seminar, Montana State University.

## PUBLICATIONS

Bown, R. R. 1988. Beaver and dams: can they coexist? Pages 97-104 in J. Emerick, S. Q. Foster, L. Hayden-Wing, J. Hodgson, J. W. Monarch, A. Smith, O. Thorne, II, and J. Todd, eds. Proceedings III: Issues and Technology in the Management of Impacted Wildlife. Thorne Ecol. Inst., Colorado Springs.

Costain, B. 1989. Habitat use by Shiras moose in a heavily logged region of northwest Montana. Abstract in 40th Annu. Meet., Northwest Sect., TWS, Banff, Alberta, Canada:15.

Craighead, J. J., F. L. Craighead, D. J. Craighead, and R. L. Redmond. 1988. Mapping Arctic vegetation in northwest Alaska using Landsat MSS imagery. Natl. Geogr. Res. 4:496-527.

Edge, W. D., and C. L. Marcum. 1989. Determining elk distribution with pellet-group and telemetry techniques. J. Wildl. Manage. 53:621-624.

\_\_\_\_\_, S. L. Olson-Edge, and N. Ghani. 1988. Response of wild goats to human disturbance near a waterpoint in Kirthar National Park, Pakistan. J. Bombay Nat. Hist. Soc. 85:315-318.

Gniadek, S. 1989. Elk and cattle relationships on summer range in southwestern Montana. Abstract in 40th Annu. Meet., Northwest Sect., TWS, Banff, Alberta, Canada:20

Harris, R. B., and F. W. Allendorf. 1989. Genetically effective population size of large mammals: an assessment of estimators. Conserv. Biol. 3(2):181-191.

Kraft Ball, S. K. 1988. Potential impacts of hydroelectric development on a mule deer population. Pages 105-112 in J. Emerick, S. Q. Foster, L. Hayden-Wing, J. Hodgson, J. W. Monarch, A. Smith, O. Thorne, II, and J. Todd, eds. Proceedings III: Issues and Technology in the Management of Impacted Wildlife. Thorne Ecol. Inst., Colorado Springs.

Kratville, S. P. 1989. Elk distribution as influenced by cattle in east-central Idaho. Abstract in 40th Annu. Meet., Northwest Sect., TWS, Banff, Alberta, Canada:19.

Loggers, C. O. 1989. Morocco [numerous photographs]. Lerner Publishing Co., Minneapolis, Minn.

Mackey, D. L., W. C. Matthews, Jr., and I. J. Ball. 1988. Elevated nest structures for Canada geese. Wildl. Soc. Bull. 16:362-367.

Marks, J. S., and J. H. Doremus. 1988. Breeding-season diet of Northern Saw-whet Owls in southwestern Idaho. *Wilson Bull.* 100:690-694.

\_\_\_\_\_, \_\_\_\_\_, and R. J. Cannings. 1989. Polygyny in the Northern Saw-whet Owl. *Auk* 106:732-734.

Marks, J. S., and P. Hendricks. 1989. On the flushing behavior of incubating White Terns. *Condor* 91:997-998.

\_\_\_\_\_, and V. S. Marks. 1988. Winter habitat use by Columbian Sharp-tailed Grouse in western Idaho. *J. Wildl. Manage.* 52:743-746.

McLellan, B. N. 1989. Dynamics of a grizzly bear population during a period of industrial resource development, I--density and age-sex composition. *Can. J. Zool.* 67:1856-1860.

\_\_\_\_\_. 1989. Dynamics of a grizzly bear population during a period of industrial resource development, II--mortality rates and causes. *Can. J. Zool.* 67:1861-1864.

\_\_\_\_\_. 1989. Dynamics of a grizzly bear population during a period of industrial resource development, III--natality and rate of change. *Can. J. Zool.* 67:1865-1868.

Meffe, G. K., and A. L. Sheldon. 1988. The influence of habitat structure on fish assemblage composition in southeastern blackwater streams. *Am. Midl. Nat.* 120:225-240.

\_\_\_\_\_, D. L. Certain, and A. L. Sheldon. 1988. Selective mortality of post-spawning yellowfin shiners, *Notropis lutipinnis* (Pisces: Cyprinidae). *Copeia* 1988:853-858.

O'Gara, B. W. 1989. Snow leopards and sport hunting in the Mongolian People's Republic. Pages 215-226 in H. Freeman, ed. *Proceedings, 5th Intern. Snow Leopard Symp.*, Conway Printers Private, Ltd., Bombay, India.

\_\_\_\_\_, and L. Zhenying. 1989. Overview of wildlife ranching in Asia. Pages 37-46 in R. Valdez, ed. *Proceedings, 1st Intern. Wildl. Ranching Symp.*, Las Cruces, N.M.

Pletscher, D. H., F. H. Bormann, and R. S. Miller. 1989. Importance of deer compared to other vertebrates in nutrient cycling and energy flow in a northern hardwood ecosystem. *Am. Midl. Nat.* 21(2):302-311.

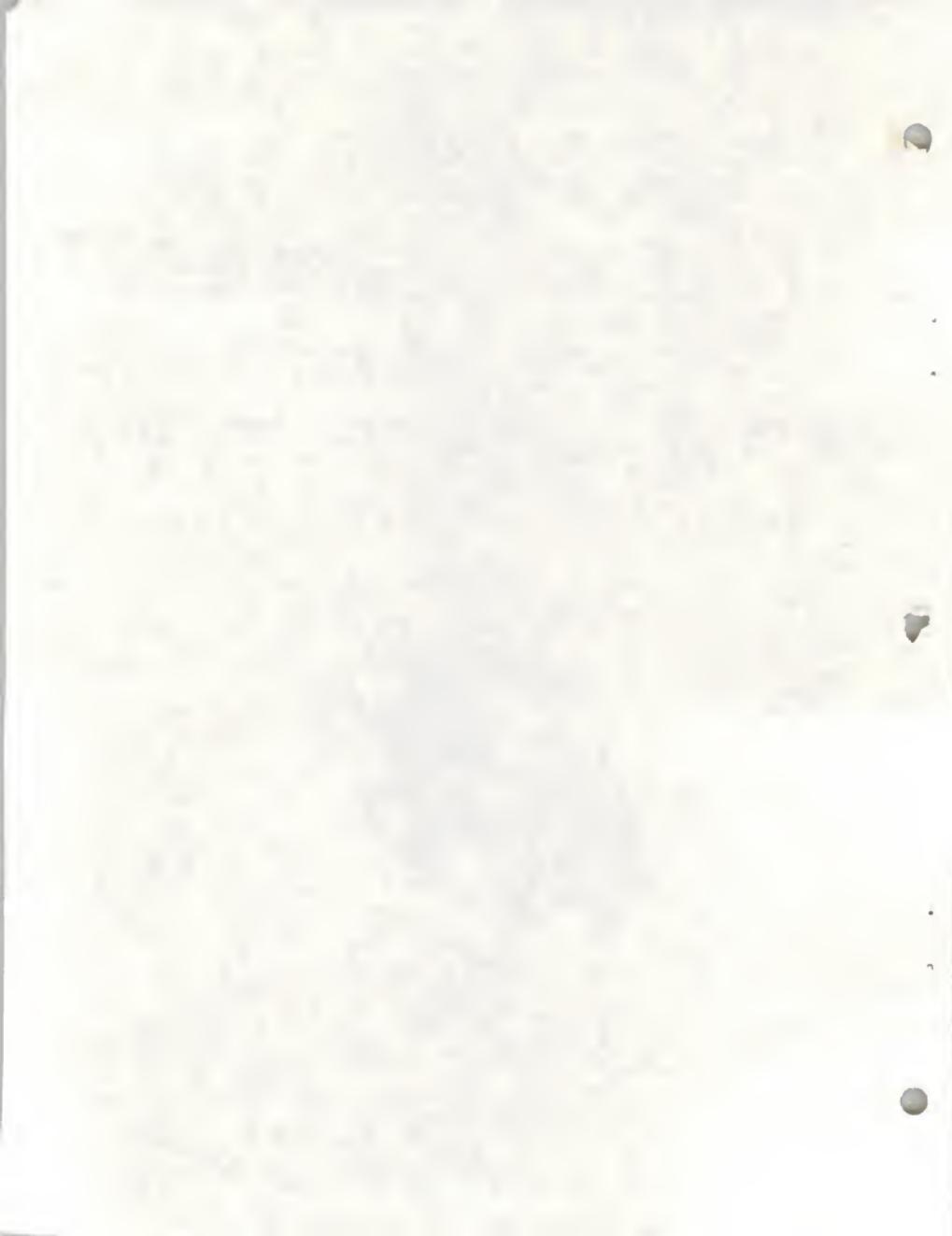
Raededeke, K. J., R. D. Taber, and D. K. Paige. 1988. Ecology of large mammals in riparian systems of Pacific Northwest forests. Pp. 113-132 in Raedeke, K. J., ed. Riparian wildlife and forestry interactions. Contrib. 59, Inst. of For. Res., Univ. Washington, Seattle.

Resh, V., A. Brown, A. Covich, M. Gurtz, H. Li, G. Minshall, S. Reice, A. Sheldon, J. Wallace, and R. Wissmar. 1988. The role of disturbance in stream ecology. J. North Am. Benthological Soc. 7:433-455.

Wang, Y., and T. L. Chen. 1989. A preliminary survey on the possibility of establishing a seabird sanctuary at Penghu. Taiwan Counc. of Agric., Taipei, Taiwan, R.O.C. 45pp.

Yates, R. 1989. Bald eagle home range, perch sites and conflicts with recreation use in Glacier National Park, Montana. Abstract in 40th Annu. Meet., Northwest Sect., TWS, Banff, Alberta, Canada:15.







Eighty-six percent of mature female mountain goats in the Snake River Range, Idaho, were observed with at least one kid. The survival rate was estimated at 92-94% for the population from July 1982 to July 1983. Observed kid survival was 88%, yearling survival was 95%, and average subadult/adult survival was 93%.

Photo by Bruce Smith

Back Cover -- Elk distribution on summer-fall range in east-central Idaho was similar during 1985 and 1986 regardless of cattle distribution on pastures. However, elk preferred a rested pasture when compared to a pasture grazed by cattle. Elk preferred to use a pasture occupied by cattle late in the grazing season rather than an unoccupied pasture that had been grazed earlier in the season.

Photo by Bart O'Gara

